

The background of the entire page is a high-speed photograph of water splashing, creating a dense cloud of white droplets and bubbles against a light blue background. The splash is centered and extends from the top to the bottom of the frame.

Volume 2

Chapter 5 Conveyance



Conveyance infrastructure includes natural watercourses as well as constructed facilities. An overall objective is to balance the operation and maintenance of conveyances to meet the needs of all sectors. (DWR photo)

Chapter 5 *Conveyance*

Conveyance provides for the movement of water. Specific objectives of natural and managed water conveyance activities include flood management, consumptive and non-consumptive environmental uses, water quality improvement, recreation, operational flexibility, and urban and agricultural water deliveries. Conveyance infrastructure includes natural watercourses as well as constructed facilities like canals, pipelines and related structures, including pumping plants, diversion structures, distribution systems, and fish screens. Groundwater aquifers are also used to convey water. Conveyance facilities range in size from small local end-user distribution systems to the large systems that deliver water to, or drain, areas as large as multiple hydrologic regions. Common water management objectives and evaluations do not consistently show preference for either regional or interregional options. Determinations must be made at the project level.

Conveyance in California

In general, conveyance facilities are used to move water from a source to where it is needed. An extensive system of conveyance facilities moves water with the use of its natural and constructed waterways. At the local level, water is distributed from locally developed sources to the end users. Since the state's ecosystem depends on water flow and quality in creeks, streams and rivers, an overall objective is to balance the operation and maintenance of these conveyances to meet the needs of all sectors.

The two longest conveyance projects in California are the State Water Project (SWP) and the Central Valley Project (CVP). Both the SWP and the CVP use natural rivers and constructed conveyances to deliver water from storage reservoirs in Northern California to a broad array of agricultural water agencies in Northern California and the San Joaquin Valley, as well as urban water agencies in the Sacramento Valley, San Francisco Bay Area, Central Coast, and urban Southern California. Levees along major rivers and levees in the Delta serve to convey flood water, but also convey water for water supply. The network of Delta levees and the hundreds of miles of interconnected channels convey water for in-Delta use and to the south of the Delta pumping facilities. Without the Delta levees, the Delta would be much saltier and unusable for water supply as we use it today.

A number of other interregional conveyances have been developed by local agencies. For example, East Bay Municipal Utility District and the San Francisco Public Utilities Commission have developed major conveyance systems that transport water from Sierra Nevada rivers directly to their service areas. The Los Angeles Department of Water and Power developed the Los Angeles Aqueduct to convey water from the Owens Valley to Los Angeles. A major source of water in Southern California continues to be diversion and distribution of Colorado River water via the All American Canal serving the Imperial Irrigation District, the Coachella Canal serving the Coachella Valley and the Colorado River Aqueduct delivering water to urban Southern California. Each of these conveyance systems is a major contributor to each region's water supplies and overall water supply reliability.

The existing network of interregional conveyance systems would not be capable of producing benefits if not for the ability of local water agencies to use conveyance to distribute imported, or locally produced, water to the end users, such as treated drinking water to residential or industrial users or irrigation water to agricultural users. In fact, conveyance is necessary in order for benefits to occur with virtually every other facet of local water management, such as desalination, recycling, use efficiency, and storage projects.

Other conveyance activities include environmental and recreation-related conveyance activities that can either be intentional or incidental to agricultural and urban water management activities. This could involve beneficiaries such as fish habitat (temperature, flow or quality improvements), riparian vegetation, or rafting and other recreational activities.

One current planning process that seeks to enhance conveyance connectivity at the regional level is the CALFED Bay Area Water Quality and Supply Reliability Program. This program is examining conveyance projects as well as other water management tools such as storage, recycling, and desalination in the Bay Area region to improve the area's drinking water quality and supply reliability. Existing regional, multiagency conveyance projects in the Bay Area already include the Hetch Hetchy Aqueduct, South Bay Aqueduct and emergency interconnects between various agencies. The program examines the effectiveness of additional regional conveyance projects that maximize operational efficiency and flexibility¹.

A major conveyance planning effort is the CALFED Conveyance Program which is expected to result in additional water supplies for the state beginning in 2006 (see Box 5-1). A summary of the water supply improvements of these project actions is provided in California Bay-Delta Authority Conveyance Program Plan for Years 5-8, as well as other documents.

Modeling studies indicate that the Delta Mendota Canal-California Aqueduct Intertie project which involves the construction of a 400 cfs interconnection between the Central Valley Project and the State Water Project south of Tracy will enable the CVP to deliver a long-term average of 35,000 acre-feet of additional water to its service area beginning in 2006. Currently, the amount, timing, and location of water deliveries from the DMC are limited by apparent canal subsidence, siltation, the facility design, and other factors. This Intertie will enable the CVP to use available capacity in the SWP's California Aqueduct. These results are expected to be reported in U.S. Bureau of Reclamation's Administrative Draft Environmental Assessment/Initial Study report on its water supply studies.

Box 5-1 CALFED Conveyance

Under the CALFED Conveyance Program, the CALFED Record of Decision calls out specific through-Delta conveyance actions that are to be studied for technical feasibility or directly implemented including:

- Increase SWP permitted pumping to 8,500 cubic feet per second
- Install permanent, operable gates in the south Delta
- Increase SWP permitted pumping to 10,300 cfs and construct Clifton Court Forebay fish screens
- Construct Tracy Fish Test Facility
- Implement Lower San Joaquin River Floodways Improvements and Ecosystem Restoration Project
- Evaluate improved operational procedures for the Delta Cross Channel and simultaneously evaluate a screened through-Delta facility on the Sacramento River up to 4,000 cfs
- Implement North Delta Flood Control and Ecosystem Restoration Improvements Program
- Consider the need for conveyance interties between the SWP and CVP in the vicinity of Delta Mendota Canal Mile Post 7 and between Clifton Court Forebay and the Tracy Pumping Plant
- Continue the Temporary Barriers Project until permanent flow control structures are built
- Facilitate water quality exchanges and similar programs to make high quality Sierra Nevada water available to urban Southern California interests
- Assist in implementation of the Sacramento and San Joaquin Comprehensive Study to improve flood control and ecosystem restoration

¹ System flexibility is defined as the ability to adaptively operate, or optimize, multiple water management strategies by controlling the timing, flow rate, location or quality of available supplies.

Under the South Delta Improvements Program, the Department of Water Resources proposes to increase the permitted pumping limit of the SWP from 6,680 cubic feet per second to 8,500 cubic feet per second and install permanent operable gates at up to four locations in south Delta channels with accompanying dredging. The project will be approved in stages. The first stage will begin after the release of the SDIP Public Draft environmental impact report-environmental impact statement and will address the number, location, construction and operation of the gates and associated dredging. The second stage will address whether to increase the SWP pumping limit to 8,500 cubic feet per second and the conditions under which it would be implemented. The staged decision process is designed to incorporate scientific information on the causes for the recent decline in the populations of several Delta fish species. Water supply studies conducted by DWR indicate that the SDIP could increase average annual water deliveries of the SWP and CVP by up to 90,000 acre-feet and 100,000 acre-feet respectively. The details of the studies will be reported in a draft environmental impact report-environmental impact statement for the SDIP to be released in late summer 2005.

Contra Costa Water District expects water quality improvement projects on Veale and Byron tracts to reduce the impact of local agricultural drainage waters that are high in salinity, and can include elevated levels of organic carbon and bromide. These projects and resulting water quality improvements are expected to result in increased exports of 10,000 acre-feet beginning in 2008 and an additional 10,000 acre-feet beginning in 2009. These results are reported in CCWD's report on its projects.

Another example of the use of conveyance to provide system flexibility within a region is the Metropolitan Water District of Southern California's network of local conveyance facilities. In addition to numerous locally developed water management options, this region receives water from multiple importation projects — namely the SWP and Colorado River. Both the importation and local options operate with different and often dynamic complexities involving water quality, hydrologic variability, costs, timing, risk levels, geographical distribution and capacities. Therefore, significant water management benefits occur by integrating water operations — using conveyance facilities — to help optimize operations based on the complexities described above.

Benefits of Improving Conveyance

The main benefits of conveyance to the urban, agricultural and environmental water-use sectors are in maintaining or increasing water supply reliability, protecting water quality,

augmenting current water supplies, and providing water system operational flexibility. For the environmental sector, benefits include in-stream flows, appropriate temperatures and water quality for aquatic and riparian habitat. It is important to recognize that, in some cases, improving water supply reliability through system flexibility is just as valuable as increasing overall supply. Indeed, conveyance capacity improvements can enhance reliability without augmenting supplies or reducing demand by increasing system operational flexibility. Other specific benefits are:

- Conveyance is necessary for many of the other resource management strategies. Conveyance is needed to move water in water transfers between sellers and buyers. In order for water to be developed by new groundwater or off-stream surface storage, diversion facilities must be capable of filling the storage. Also, facilities must then be in place to convey the storage releases to the users at the right times and flow rates.
- Conveyance improvements can provide the flexibility to divert and move water at times that are less harmful to fisheries.
- Conveyance can improve water quality by moving more water when water quality conditions are better or less impacted by the movement of water, or by moving more water to improve water quality (that is, decrease salinity in the Delta).
- Given the high-intensity, short duration characteristics of California's hydrology, improved conveyance capacities combined with adequate surface water or groundwater storage can enable diversions of more water during high flow, less competitive periods, and consequently reduce the pressure to divert water during low flow, highly competitive periods.

Other benefits of conveyance improvements generally include:

- Enhancement of flood control capability
- Increases in water use efficiency
- Protection of water quality
- Increases in resiliency to catastrophic events
- Reductions in operating costs
- Improvements to instream and riparian habitat

Potential Costs of Water Conveyance

Conveyance costs can be a significant portion of the costs in a water management system. The cost of water conveyance heavily depends on the local circumstances, how far and when the water needs to be conveyed and topography (for example, pumping vs. gravity flow). For example, it costs less to convey water from Oroville Dam to the Delta, all gravity flow, than

to convey water from the Delta to the South Coast Hydrologic Region. Conveying water through the Delta and over the Tehachapi Mountains increases water costs due to the canals, pipelines and pumping plants that need to be provided and the operating and maintenance costs of these facilities. However, by providing additional conveyance capacity to move water during off-peak energy demand periods, when power costs are lower, operating costs can be reduced. CALFED estimates of Delta conveyance improvements which are most likely to be implemented in the next 10 years are expected to cost about \$230 million to \$260 million to construct. Other potential conveyance improvements that are currently being studied could cost an additional \$1.6 billion to \$2.1 billion over the next 10 years. However, until all alternatives for these facilities are fully evaluated, these costs are tentative.

Major Issues Facing Conveyance

Maintenance

It is essential, at a minimum, to maintain the current level of conveyance capacity for both natural and constructed facilities. This is likely to take on very significant importance over time due to aging water infrastructure, the increasingly higher costs of maintenance, and the increasing demands with increasing population. Substantial reinvestment will be required just to maintain the current level of benefits. While concerns are likely to focus on adequate financial resources to maintain conveyance infrastructure, there is the special case of diminishing conveyance capacity in natural watercourses. This is most critical from both a water conveyance and flood passage standpoint in the channels of the Delta. Diminishing conveyance capacity is also a problem for flood management facilities such as bypasses that over time fill with silt, debris and plant growth that reduce the effectiveness for passing flood waters. In addition, rivers and streams depend upon a watershed which is in good condition. Watersheds provide the critical functions of snowpack storage, runoff, water quality, and water filtration in groundwater. Therefore, watershed management activities (see Watershed Management narrative in this volume) will also require investment as part of the natural infrastructure of the state's water system.

Science

Water managers, planners and biologists continue to work to identify and understand the relationships between hydrodynamics, flow timing, fish timing and movement, water temperature, geomorphology, water quality, environmental responses, global climate change and other conveyance related considerations so they can optimally plan, develop, operate and maintain natural and constructed conveyance

infrastructure. Various CALFED programs have been studying these factors and expect to develop plans to improve the operation of the state's conveyances with a balanced approach to meeting the needs of its people and the environment. These studies are most evident in the Delta where export demands must be met, flood control improvements are needed, water quality improvements are being sought, and Delta fisheries and their habitat must be protected.

Regulatory Compliance

New conveyance projects may need to address impacts under the application of various laws, regulatory processes and statutes such as Public Trust Doctrine, Area of Origin statutes, California Environmental Quality Act, National Environmental Protection Act, the Clean Water Act and the Endangered Species Acts.

Local and Regional Water Supply Reliability

Greater interconnections are needed to help improve water supply reliability, as evidenced by how California has responded during drought conditions. Each water system has its own level of water supply reliability, based largely on storage and conveyance systems, hydrology, and level of demand. Operational flexibility, particularly during emergency conditions is a primary benefit of greater interconnection of independent water systems.

CALFED Through-Delta Strategy

The CALFED objective for its conveyance program employs a through-Delta approach to conveyance. Delta conveyance capacity and operational restrictions have been identified as key limitations to improving the water supply reliability and water quality for in-Delta and water export users. The current lack of flexibility also limits the ability to take advantage of other water management strategies such as water transfers, including transfer of previously stored water, conjunctive management, groundwater storage, and north of Delta water use efficiency. A key challenge for the California Bay-Delta Authority is to implement a strategy that will provide the necessary flexibility to the system and be protective of water quality, Bay-Delta hydrodynamics, fisheries, and habitat.

Area of Origin Interest

Interregional movement of water is sometimes opposed by the source-water counties. In addition to struggling to augment local water supplies to meet growing demands, area of origin interests often feel that the downstream water users could or should be more committed to assisting in managing the natural infrastructure, such as watersheds, from which their imported water originates.

Recommendations

The following recommendations apply to state, federal and local water agencies:

1. Assure adequate resources to maintain existing constructed and natural conveyance facilities and capacity and condition. This may include development of a strategy to maintain channel capacity in areas of the Delta and in flood management facilities.
2. Promote development of more extensive interconnections among water resources systems such as, and in addition to, the SWP-CVP intertie or improved connectivity within the Bay Area Region. It is likely that leadership and funding on this will be at the local level.
3. Financially support the CALFED through-Delta conveyance improvements per CALFED ROD.
4. Financially support the lining of AAC and Coachella Canals to make water available to the South Coast Region.

Selected Reference

CALFED Record of Decision and Conveyance Program

www.calwater.ca.gov/.